The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

VOL. XLII. No. 1089 May 11, 1940 Annual Subscription, 21s. Overseas, 26s.

Chemical Engineering and Canning

THE ramifications of chemical engineering are a source of continual surprise even to those who believe that they know something about the subject. At first sight the title of the paper read by Mr. T. W. Jones before the Chemical Engineering Group: "Chemical Engineering Problems in the Canning Industry," provoked the thought that it was a long stretch from true chemical engineering to putting food into tins. In the outcome, however, Mr. Jones showed that the canning industry is faced with problems of heating, cooling and corrosion which require considerable application of that branch of physical science which is called chemical engineering.

The problem of producing a sealed tin containing sterilised food in the optimum condition for human consumption is one of extraordinary difficulty. It is the problem that faces every manufacturer who has to pass heat through a substance which may be spoiled by overheating, but which must be raised above a certain minimum temperature. It is faced, for example, by those who carbonise coal when they must pass heat through layers already coked in order to heat adequately the centre of the charge. In canning, the heat is necessary to kill the bacterial organisms and for each there exists a minimum temperature which must be reached if the heat treatment is to be effective, and above this temperature the time of heating is also fixed by an experimentally determined time-temperature curve, known in the trade as "Thermal Death Times." In order to reach the T.D.T. of given bacteria under given conditions it may be that the food through which the heat is passed may be heated above its proper temperature and may be so changed as to be spoiled for food purposes. Evidently, when the food is sterilised in the can, the problem of heating the food along the central axis of the can for a sufficient time without spoiling the remainder is not simple. Similarly, once the central portion of food has been raised to its proper temperature, it may go on cooking for some time because of the slowness of heat transference during cooling.

The problems are solved in various ways depending upon the nature of the food product. The simple method of heating cans containing unsterilised food in batches or by a continuous process at a sufficient temperature and for a sufficient time is suitable only for liquid foods in which circulation can occur, though it is cheaper than other methods. For many foods, especially those containing cereals which would partially carbonise (or "brown"), the heating is conducted in stages: the temperature is first maintained at 100° C. until the whole contents have reached that temperature, and then the can is further heated to the finishing temperature. A third method, which does not seem to meet with unqualified acceptance, is to heat the cans three times at intervals of 24 hours, each time maintaining the maximum required temperature just until the central axis has attained that temperature, thus allowing undestroyed spores to grow to the vegetative form between each heating, and so killing them in stages. This method, of course, has no general chemical engineering application, but applies to food only.

Cans for holding the food are manufactured from tinplate consisting of 28 to 32 B.G. steel sheet having a tin coating of between 1.5 and 3 lb. per 112 sheets measuring 20 in. by 14 in., the plate being lacquered when foods containing much colouring matter are used. The lacquer consists of synthetic or natural resins with which can be incorporated substances having an inhibiting effect on the corrosive action that the food products might otherwise have on the metal. Zinc oxide, for example, forms sulphide and prevents the sulphur in certain vegetables from reaching the metal. Corrosion, always the dread of the old-fashioned housewife, consists in general either of rusting of the steel plate beneath the tinned surface, or of electrolytic action on the tinned plate liberating hydrogen which causes "swells" that ultimately perforate the container. The rusting is straightforward corrosion on metals in presence of CO_2 and oxygen, and is avoided when the CO_2/O_2 ratio exceeds 1 or 1.1. It would be interesting to know whether this ratio is of general applicability in corrosion problems. The generation of electrolytic hydrogen, which can be overcome best by creating a high vacuum in the can, results from the presence of pores in the tin coating so that the tin, steel and acid juices form an electrolytic cell. It is a curious fact that, though lacquer will prevent attack on the tin, it will assist attack on the steel, probably because discontinuities in the lacquer occur at discontinuities in the tin coating.

Mr. Jones dealt with the vexed question of solution of tin in the food and its effect upon health. He quoted a number of authorities, the conclusion seeming to be that although quite large amounts of tin can be dissolved in this way, "tin in the amounts ordinarily found in canned foods and in the ordinary individual diet is for all practical purposes eliminated, and is not productive of harmful effects to the consumer of canned goods. A comfortable thought, but it seems that there is yet work to be done upon the protective coatings used in the food industry.

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NOTES AND COMMENTS

Man-Power in Industry

WE have received an interesting comment on our last week's leading article, which appeared under the above title. The matter concerned is the reservation of key men from military service, a problem that affects all branches of industry in their most vital quarter—the question of keeping up supplies for the export trade. The suggestion that we made of establishing tribunals for assessing the claims of key men to be reserved from military service is admitted to be an excellent one, but the contention is that our scheme did not go far enough, and that there is one category of key men that would not be covered by our proposals. Suppose, for example, that 25 is the reserved age for men employed in a certain specific job, probably a job requiring years of training. It is obviously quite possible that a young man, aged 24 years and 9 months when the time comes for him to register for military service, may have spent six years with his firm in training for this specialist job; and, if he is worthy of his salt, he will be fully as competent to carry out this specialist job as he would be three months later. He is, in other words, a key man; and his departure will upset the vital work of his firm. Nevertheless, he has to go. Here, therefore, is a situation where tribunals could do really valuable work. No doubt some claims might be made where the importance of the employee was insufficient to warrant his reservation; but in most instances the tribunal would have the opportunity of checking the operation of the red-tape machine and of reserving for industry the personnel that is essential to the efficient working of the national war effort.

Chemical Research in Glasgow

THE Royal Technical College, Glasgow, has just produced Part 4 of Volume 4 of its Research Journal, a record of some of the research work carried out in the College by the staff and senior students. Chemical research has been given the place of honour at the beginning, and the work reported on includes "The Action of Amines on Semicarbazones," by A. B. Crawford; "Metallic Complexes of Certain *o*-Substituted Azo Dyes," by J. L. Boyle, Professor W. M. Cumming, and A. B. Steven; "The Chemical Analysis of Milk Powder," by R. O. Scott and Professor Cumming; continuations of F. Rumford's work on "The Correlation of Adsorption and Catalytic Activity" and "Plate Efficiency in Fractionating Columns"; and "The Systems MnO-TiO_2 and MnO-FeO-TiO_2," by J. Grieve and J. White. Scott and Cumming's researches are particularly interesting as bearing on the industrial side of the chemistry of nutrition, special attention having been paid in analyses to the inorganic constituents of dried milk, of which little is known. Ash analysis has yielded interesting results, particularly in regard to elements present in minute traces, which may none the less be essential growth-factors. The *p*H was discovered to be about 7.50, very different from that of fresh milk, which is about 6.5. A Hilger medium quartz spectrograph was used in the spectroscopic examination of the ash.

The Uranium "Menace"

REPORTS in the daily Press announce the isolation in America of a uranium isotope of A.W. 235, and the usual claims are made of the revolutionary changes that can be worked by its potential energy. "One pound, it is asserted, would be equal in power output to five million lb. of coal," etc. The chemistry of radioactive materials is still in its infancy, and it would be rash to prophesy the limits that may be set to the uses of such materials, but reference to up-to-date authorities reveals that the percentage of this isotope of uranium is less than 1. Our suspicions are aroused, therefore, when "it is suggested that within a few months a method of securing large quantities may be devised," and "it is asserted that German physicists, chemists, and engineers have been ordered to drop all other research and devote themselves to this aspect alone." We feel more at home with the "London Authority," who said that the quantity available was likely to be in the nature of a millionth of a pound. In his view, with which we fully concur, the discovery is unlikely to provide a "secret weapon" for either side in the war.

Chemical Imports in Latin America

THE current report of the Argentine Chamber of Commerce in Great Britain announces an exceptionally high level of imports during February last. Britain's share of the total import trade has risen from 19.4 to 20.9 per cent., and a very large rise has occurred in the item "Chemicals, oils and paints." The increase here is 68.1 per cent. in tariff value and 65.8 per cent. in quantity. Import statistics from Costa Rica for 1939, reported in *World Trade Notes* of the U.S. Department of Commerce, are available for caustic soda, carbon dioxide, and "ammonia," among chemical products. Caustic soda imports came from the U.S.A. (214 metric tons) and the U.K. (191 metric tons); carbon dioxide from Germany (5268 kg.), U.S.A. (235 kg.) and the U.K. (9 kg.); "ammonia" from Germany (23,056 kg.), U.S.A. (21,487 kg.), the U.K. (3147 kg.), and Switzerland (19 kg.). It would appear that there is a field here for British chemical exports that would be well worth exploring in greater detail.

In view of the increased postal charges, the price of a copy of THE CHEMICAL AGE by post will be 8d. The post-free subscription rates at home and abroad, however, will remain at 21s. and 26s. per annum respectively.

THE POTATO PRODUCTS INDUSTRY—I

Recent Developments on the Continent

FROM A SPECIAL CORRESPONDENT

AN industry which so far has made little headway in this country—although on the Continent it has been profitably practised for over a century—is that of the manufacture of meal, starch, dextrin, glucose and alcohol from potatoes. Large quantities of such products are used in Great Britain, and the greater part, in spite of war restrictions, is still imported. In the years immediately before the war the imports of potato products averaged about 50,000 tons per annum. In Germany and its contiguous countries there are several thousand potato-alcohol distilleries, and a similar number of starch and glucose factories, in full seasonal operation. Some of these concerns are only on a small scale, dealing with the tubers grown within a few miles of the factory, thus saving heavy transport costs. Although potatoes have a much lower starch content than any of the cereals, the former yield more starch per acre of land. For example, wheat, containing about 60 per cent. starch, produces about one ton of grain per acre, or 12 cwt. of starch. Potatoes, with only about 20 per cent. starch content, give 5 tons to the acre, or about one ton of starch. The growing of potatoes for food is often regarded by the farmer as unprofitable, or at the best showing only a small margin of profit, owing to the heavy fertilising necessary; but the raising of potatoes for manufacturing purposes is a different proposition. In this instance tubers that are decaying, those broken by the harvesting implements, and the very small ones usually left in the field to rot, may all be successfully utilised. Further, the valuable nutriment, potash, nitrogen and phosphorus, extracted by the potatoes from the soil, may be practically all returned to the land through the waste of the factory processes. This becomes possible because the utilisation of the tubers from many square miles is concentrated at one factory, and the distribution of the by-products offers no difficulties. The waste material of the potato-products factories is made use of in two ways, so far as the Continent is concerned, either direct on the soil as a fertiliser, or, whenever practicable, as cattle-feed, which permits the farmer to maintain a larger head of stock, and thus indirectly to obtain an ample supply of manure. In this country the annual potato crop averages probably between five and six million tons, and the consumption between seven and eight million tons, the balance being met by imports. So that as yet no home-grown potatoes are available for manufacturing purposes. The industry, in Germany, for example, only attained its present importance through being heavily subsidised by the German Government in the initial stages, and it would appear that similar measures are required in this country. The object in the present series of articles is to give a brief description of the processes, from the practical viewpoint, as carried out on the Continent to-day.

Potato Meal

Potato meal differs essentially from potato starch in that it contains the fibrous portion of the tubers in addition to the starch. It is imported into this country from the Continent for use chiefly in the textile trades, for the preparation of sizes and dressings, a purpose for which it is said to be more efficient and cheaper than ordinary starch for various grades of textile materials. In Germany the meal is used for human consumption, and nearly every household has its bin of *Kartoffelmehl*, from which home-made bread and pastries are produced. Its manufacture is conducted on the Continent either by means of small portable plants, which can be moved from farm to farm as desired, or in large central factories, which may have an output of 100 tons per day or more. The production of potato meal affords a ready means for the farmer to convert his potato crop into a product with excellent keeping properties. Thus the large annual loss of potatoes, estimated by various authorities to be between 40 and 50 per cent., through decomposition, frost, etc., is avoided. The method of manufacture consists essentially of cleansing the tubers thoroughly by means of a special type of washing machine. The importance of removing the least traces of dirt cannot be overestimated, as such impurities would quickly decompose the finished product. To convert the tubers to a pulp they are first put through a grinding machine, which will be described later under "Potato Starch." Potatoes so pulped are next steamed or "cooked," generally under a

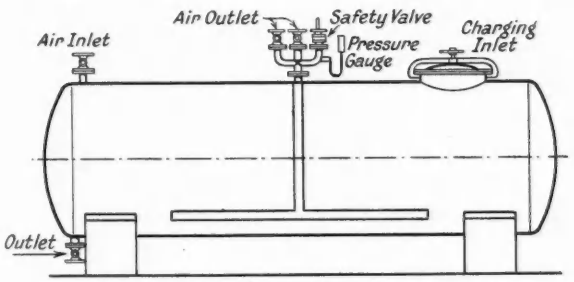

Fig. 1. Pressure Vessel for Potato Meal

pressure of one to two atmospheres, in a steel autoclave, such as that illustrated in Fig. 1. A temperature sufficiently high to destroy any bacteria present is thus attained, so that the pulp leaving the autoclave is sterilised. Over the autoclave is generally placed a hopper to hold the pulp, with a chute leading to the charging hole of the pressure vessel. In the larger factories it is possible to utilise waste steam for the autoclave and so effect an economy. When the pulp is in the vessel, steam and air mixture is first blown through for a few minutes to clear any volatile impurities from the pulp. The clearing out of these is more important than appears at first sight, because if allowed to remain they act on the starch of the pulp, under the influence of heat and pressure in the autoclave, hydrolysing the starch to glucose, and this in turn decomposes the finished meal by fermenting. The steam and air outlet valves are then closed and the pressure allowed to rise to the necessary degree. At the end of thirty minutes or so the outlet valve in the base of the vessel is gradually opened and the internal pressure forces the pulp out in a continuous stream. Usually the horizontal type of autoclave, as illustrated, is slightly inclined towards the outlet valve to facilitate completely clearing the batch from the vessel. Occasionally an open vessel is used in place of a pressure vessel, when a preservative is often added to the pulp, such as boric acid solution, particularly when the product is to be used for cattle-feed and not for human consumption. On portable plants the steam supply is obtained from the boiler of the engine driving the plant. In every case the steam is admitted to the pulp in the form of a fine spray through a perforated coil in the bottom of the vessel.

The resultant cooked pulp is then passed through a disintegrator or similar type of grinding machine, which breaks up the peel or any hard portions into fine particles. If intended for human consumption, the peel and coarser fibrous matter are removed by running the product from the distintegrator into a vessel partly full of water, when the peel and heavier matter sink to the bottom. The suspended meal may then be drawn off with the water and filtered to remove the latter, while the heavy matter separated out may be run off from the bottom of the vessel to be used for cattle-feed. Drying is usually accomplished in an endless band dryer, heated by a series of steam pipes at convenient distances from the moving belts, and may be done with or without vacuum apparatus. Drying under vacuum is, of course, a quicker process; less

steam is required, and a lower drying temperature is permissible, thus tending to preserve the quality of the meal. Normally the drying operation is carried on until the meal has a moisture content of about 18 per cent. It is next passed through a grinding and sifting machine, which breaks up any lumps formed during drying, and grades the product according to the mesh of the silk or metal sieves used. Such a product generally undergoes no deterioration over several years of storage; the storage room required is only a small fraction of that needed for the original potatoes from which it was manufactured.

Potato Starch

The potato starch, or farina, used in Great Britain is invariably imported, such annual imports including about 20,000 tons from Holland, and a similar amount from other European countries. Although the manufacture of potato starch is, in general, a seasonal occupation, confined to the months of October, November and December, some factories carry on its manufacture all the year round. The large stock of potatoes necessary for this are prepared for storage by a mechanical brushing off of the adhering soil, then kept in good condition by maintaining a storage temperature of a few degrees above 0° C. In some cases this is accomplished by ventilation with ozonised air previously cooled to about zero. The starch content of potatoes averages about 20 per cent., and the water in freshly gathered tubers may be as high as 76 per cent., but in potatoes stored for some months the water content decreases to about 70 per cent. The remainder of the tuber is made up of cellulose, pentosans, with varying proportions of starch hydrolysed to sugar, and inorganic matter. Normally, the nature of the inorganic matter derived from the soil determines the proportion of hydrolysed starch in the potatoes, this conversion to sugar being more in evidence with acidic inorganic material. In starch-making the object is to extract the maximum amount of starch as free as possible from the other constituents of the tubers, which if allowed to remain would quickly give rise to decomposition of the starch. In practice the proportion of starch recovered from the tubers does not usually exceed 97 to 98 per cent., the balance remaining in the exhausted pulp. Whilst in the manufacture of potato-meal the starch content of the potatoes is immaterial, for starch-making and its derivatives the starch content is all-important. Most of the bigger Continental factories have their own laboratories in which the starch content is determined by the usual methods, but the smaller concerns make use of a less scientific, but nearly as accurate, method. This is based on the specific gravity of the potatoes, which varies in accordance with the proportion of starch and solids present, and it is possible to work out a table giving water content, total solids, and starch content, accurate to within ½ per cent. Before ascertaining the specific gravity the potatoes are first washed free of all adhering matter. They are next weighed while immersed in water, then carefully dried externally and weighed in air. Their weight in water is taken from their normal weight in air, which gives the weight of a volume of water equal to the volume of the potatoes. The figure for this volume is divided into the normal weight of the potatoes, which gives the specific gravity. The following table shows the values obtained by the writer when using this method.

Weight of 10 lbs. of potatoes in water.	Starch Content.
oz.	%
12	14.5
13	16.2
14	17.8
15	19.3
16	20.7
17	22.0
18	23.2
19	24.3

The factory processes in general use consist of washing the tubers, breaking them down to a suitable pulp, washing out the starch from the pulp, separating the starch from the fibrous matter, eliminating foreign matter, and finally drying the starch.

Potato Washing

Although a potato-washing machine is a relatively simple apparatus, it plays an important part in starch manufacture, for if all dirt and impurities are not removed at this initial stage the subsequent starch liquor will be permanently fouled, since there is no practical method of expelling such heterogeneous matter at a later stage in the processing. Not many years ago it was a frequent occurrence for factories to produce off grades of starch through faulty washing and subsequent contamination. In recent years Continental engineering firms have given much attention to improving the customary type of washing machine. Fig. 2 shows a modern washing apparatus, consisting of a rectangular vessel divided up into several separate compartments for containing the potatoes and wash water, with a shaft, provided with agitators, through the entire length of the vessel. The larger machines of this type handle up to 10 tons of potatoes per hour. Each compartment is provided with a draining valve so arranged that the individual compartment can be drained off without disturbing the continuity of operations. Water passes through the washer counter-current to the potatoes. The revolving of the paddle arms causes the potatoes to be thrown against each other, and this friction loosens the adhering soil to be washed away by the water. Some types of washer have a spiral or worm throughout the length of the base of the vessel which enables the tubers to be constantly passed through the machine entirely by mechanical means. The body of a potato washer may be of concrete, which is preferred on the Continent, or of steel plates. In some factories the water for washing is first made use of to transport the tubers from the storage house to the machine, by fixing an open trough of concrete or steel at a slight incline from the warehouse to the machine. A pump, fed from an adjoining water supply, pumps a constant stream of water into the trough and the movement of the water towards the washer carries the potatoes along with it. This

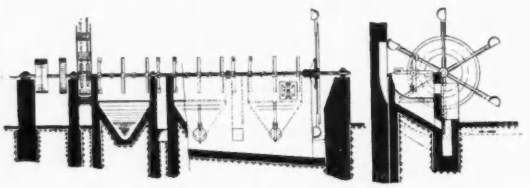

Fig. 2. Potato Washer and Elevator

contrivance has the advantage of removing a lot of the soil, etc. while the tubers are still in the trough and so lightens the work to be done in the washer, with concomitant increased output. The washer illustrated has an elevator, of the endless chain-bucket type, which picks up the potatoes as they leave the last compartment of the washer and conveys them to the top floor of the factory to be pulped. In most starch factories it is the general rule to begin operations proper on the top floor, because thereafter the material is in the form of liquor which may be run to other parts of the building by gravity, so saving both labour and power. The preliminary machine for converting the potatoes to pulp is known as a rasping machine (Fig. 3); in this the starch-containing cells of the tubers are torn apart so that in further processing the liberated starch may be thoroughly washed out. These machines are, therefore, among the most important in the factory, for on their efficiency depends the yield of starch from the potatoes. A rasping machine consists of a drum, rotating at about 1000 r.p.m., mounted on a cast-steel shaft running in ball bearings. The surface of the drum is fitted throughout its circumference with narrow strips of steel in between which are fixed toothed blades, with teeth projecting slightly above the edge of the supporting steel strips. When potatoes are fed into the hopper at the top of the machine they are pressed against the serrated drum surface by a series of adjustable steel blocks, made to

lock automatically if they are forced too near the blades, thus preventing damage to the latter. The smaller sizes of these rasping machines generally have only one pair of blocks, but the larger sizes have several such pairs. On such a machine the only part exposed to excessive wear and tear is the serrated blades, and as these are very vulnerable it is necessary to guard against any hard material coming into contact with them. Some of these machines are made so that the drum, complete with its blades, may be lifted out bodily from the casing, and a similar drum loaded with sharpened blades inserted. This operation occupies only a few minutes. With other machines a sharpening device is provided, which sharpens the blades as the drum rotates. To increase the yield of starch various experiments have been made with different types of disintegrating machines, and the ordinary edge-runner stone mills have been used amongst others; but with these machines the pulp tends to clog and the output is lowered. The present method on the Continent is to use the rasping machine to convert the potatoes to a rough pulp and

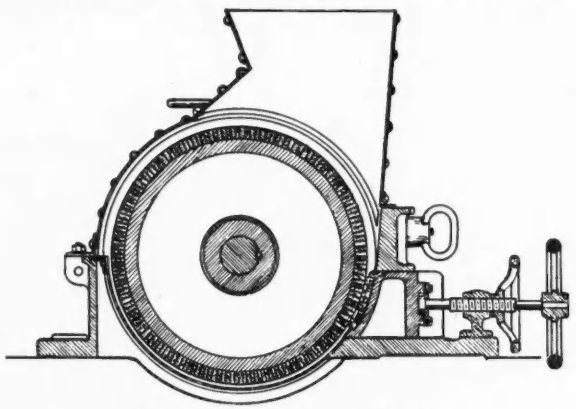

Fig. 3. Potato Rasping Machine.

then to pass this pulp into another machine specially designed to break it up still finer. With a rasping machine disintegration can only be carried to a certain point, and when this is reached the serrated blades no longer have any effect on the particles because the latter can slip undamaged between the teeth of the blades. To break open the cells thoroughly, therefore, a machine which works by rubbing and not by tearing is necessary, but to employ such a rubbing or grinding machine to do the whole work of converting the potatoes to the necessary degree of fineness would not be practicable, so that the specially designed grinding machine always works on the pulp from the raspers. A machine of this type is illustrated in Fig. 4. The stones in this grinder are made of carborundum of a specially selected grain to withstand the necessary wear without resetting. One of the stones is stationary, while the other one is made to rotate at a high speed, thus permitting a relatively big output when compared with the usual type of slow-moving stone mill. The driving shaft runs in ball bearings and the stones are held together by a special ball bearing which makes it possible to attain the finest adjustment. Since the stones are cemented into their rings and held in position by bolts inserted after the stones are taken from the mould they are easily removed when worn out. In some starch factories, where the serrated blades of the rasping machines have widely-spaced teeth, thus producing a coarse pulp, but simultaneously a bigger output, the coarse pulp is first put through a similar mill provided with finely ground hardened steel grinders; the pulp from this mill then goes through the carborundum stones. Normally the casing of these mills is of cast iron but when pulp containing sulphurous acid is put through they are usually protected by antacid paint, or else cased in bronze.

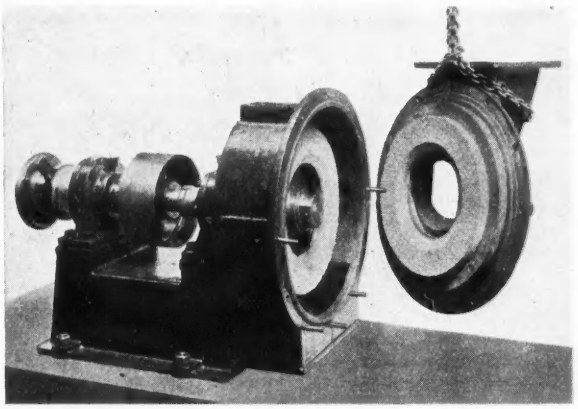

Fig. 4. Pulp-grinding Machine for Potato Starch production

[*To be continued.*]

LOW-TEMPERATURE DRYING OF FOODSTUFFS

Rapid freezing, with subsequent storage at low temperatures, is probably the most effective way of preserving the desirable properties of foodstuffs. If, however, the moisture present in the frozen foodstuffs in the form of ice is removed by evaporation in a high vacuum, the desiccated products can be transported and stored without the need for refrigeration, and there is in addition a large saving of weight. In view of these possibilities, a small-scale plant, designed to dry foodstuffs at low temperatures, has been in operation at the Low Temperature Research Station during the past year on behalf of the Food Investigation Board of the Department of Scientific and Industrial Research. Many different foods have been dried, such as fruit, vegetables, fruit-juices, meat, eggs, butter and milk, and it is now clear that the products obtained are in general superior to those obtained by other methods of drying. British firms interested are invited to get into direct touch with the Superintendent, The Low Temperature Research Station, Downing Street, Cambridge (telephone: Cambridge 4477), who will be glad to give them further information. Application has been made for a patent (B.Pat. Appl. Nos. 617/39 and 3181/39).

NEW AMERICAN RESIN

The advantages of "Staybelite Resin" as a compounding material for rubber are described in the New York *Rubber Age* (1940, *46*, 5, 300). The adhesive material for surgical and insulating, etc., tape, is made by compounding rubber with rosin, but with ordinary rosin the life of the adhesive is limited, since it causes oxidation of the rubber, resulting in loss of tack and discolouration.

The Hercules Powder Co. of America have developed in Staybelite Resin a rosin which causes no change in rubber. This is obtained by hydrogenating rosin. The product is pale in colour and does not darken on exposure to light and air; its m.p. is slightly lower than the untreated rosin, but is little different in other physical properties and can be compounded with rubber by the same processes as used for rosin. One important advantage is its extremely low metal content, *e.g.*, only 2-3 p.p.m. of Cu, and no Mn. Adhesives made with Staybelite show good tack retention after two years under ordinary conditions, and also after being maintained at 40° C. for 168 hours under a pressure of 300 lb./sq. in oxygen.

A glyceryl ester of Staybelite, having an acid value of 10 or less, has also been developed and is of value where low acidity is of importance. Its m.p. is slightly higher than that of Staybelite.

MEASUREMENT OF FLUID FLOW*

Basic Principles of the Instruments Employed

LARGE as is the number of instruments or meters that have been devised for measuring fluid flow, they almost all reduce to four categories, which depend for their action on:

(i) pressure changes produced by the motion of the fluid relative to parts of the instrument;
(ii) mechanical effects, such as the rate of rotation induced in a system of inclined vanes suitably mounted and exposed to the stream;
(iii) the rate of cooling of heated bodies immersed in the moving fluid;
(iv) direct measurement of the weight or volume of fluid flowing.

Apart from questions of cost, space available, ease of installation, and other factors, the choice of an instrument for a particular purpose will be influenced by two important considerations—the need for calibration and the accuracy attainable. With the exception of those devices which operate by direct weighing of the quantity of a liquid passing along a pipe or channel, there is no instrument for measuring fluid flow which does not fundamentally require calibration. Obviously, therefore, one will prefer an instrument whose calibration, once determined, does not change with time, and does not vary from one instrument to another made to the same pattern. Rigid compliance with the last-mentioned condition implies that only one representative instrument of a type need be calibrated, but it is not easy to achieve when the instrument includes moving parts which introduce mechanical friction. Friction is also liable to cause the calibration to change with time. Thus those instruments in category (ii) which have moving parts generally require individual calibration and subsequent re-calibration at intervals. Friction, however, does not affect the calibration of instruments with moving parts coming within category (iv). Some of these are individually calibrated for another reason, namely that it is easier to do this than to ensure that the volume of each compartment shall be equal to any desired value within the limits of accuracy specified for the performance of the meter. Others have to be calibrated for leakage or "slip." Thermal meters of category (iii) also require individual calibration and subsequent periodic checking.

In contradistinction to all these, pressure instruments of category (i) have the characteristic property that their calibration is a function only of their shape and of the conditions of flow. As a rule, therefore, a pressure instrument never needs re-calibration once its factor has been determined. Furthermore, its properties can to a large extent be predicted from the fundamental law of geometrical and dynamical similarity. Pressure instruments can be regarded, therefore, as having a greater practical value than most other types. One such instrument, the pitot-static tube, has become established as the standard of air speed measurement in all aerodynamic work, and it might well be much more widely used as a standard in other branches of fluid metering.

Pressure and Mechanical Anemometers

Pressure anemometers may be classified in two groups—those which provide spot readings of local fluid velocity, and those which give directly from a single observation the average rate of flow over an area. The best known example of the former type, or pressure-tube anemometers, is the pitot-static tube, and of the latter, probably, the plate orifice. A pressure-tube anemometer consists of two elements, each comprising an orifice or group of orifices at which pressure is set up by the moving fluid. One element usually measures the stagnation pressure, but the pressure at the other differs in different instruments

The most common types of mechanical anemometers are the vane anemometer used in air flow measurements and the water current meter. Both incorporate a rotating element actuated by the stream of fluid, and the speed of rotation of the element is a function of the velocity. The moving part may be a set of inclined vanes, as in the vane anemometer, or a set of cups or paddles. The vane anemometer is a simple instrument, and when properly used is capable of all the precision ordinarily required. It is particularly useful, when conditions are suitable, for the measurement of low gas speeds, the lower limit with which it can deal being about $\frac{1}{2}$ to $\frac{3}{4}$ ft. per sec. in the case of air at ordinary temperature and pressure. Its main use arises in measurements in large ducts or ventilating shafts, or in smaller ducting when an open end is accessible in which to insert the anemometer.

Hot Wire and Kindred Anemometers

The Katathermometer is an instrument designed by Dr. Leonard Hill primarily for physiological investigations on ventilation and rate of cooling, but it has since been found to have useful applications for the measurement of air or gas speed. It is essentially an alcohol thermometer with a large bulb, and a range of 95° F. to 100° F. marked on the stem. The instrument is heated (either electrically or by immersion in hot water) until the alcohol column is well over the 100° mark and the time taken for the top of the column to fall from the upper to the lower mark is observed. In practice, the calibration consists of a curve between velocity and time taken for the alcohol column to drop through the specified temperature range. Somewhat akin to this, in that a hot element gives up heat to the moving fluid, are the electric flow meters devised by Callender and Thomas. The latter is on the market in a form suitable for industrial use. Both these instruments were designed for measuring air flow in closed pipes, and indicate the mass flow from measurements of the heat energy which must be supplied to the moving stream in order to maintain a prescribed difference of temperature between two given sections, one on either side of the heat source.

Quantity and Other Meters

The fluid flowing through a quantity meter passes in successive and more or less isolated weights or volumes, by the alternate filling and emptying of containers of known or fixed capacity. Measurement by weight is only practicable when metering liquids, but volumetric meters are used for both liquids and gases. In both types the indicating mechanism is essentially a counter which may show simply the number of times the meter compartments have been filled and emptied, or may be graduated directly in weight or volume.

For many purposes a development of the Ewing ball and tube flow meter is useful. The main objection to this meter was unsteadiness of the ball. This could be partly overcome by inclining the tube, but a better solution is that adopted in the instrument known as the Rotameter, in which the ball is replaced by a small specially shaped float having spiral grooves in its surface, by means of which it is maintained in rotation about a vertical axis as the fluid streams past it.

Another proprietary instrument worthy of mention is the Velometer originally developed by Boyle in America. The most important component of this instrument is a meter consisting of a balanced, damped, pivoted vane which can be deflected by a very light current of air or gas and carries a pointer moving over a graduated scale. The movement is enclosed in a case having two orifices, one to admit the air current and the other to provide the exit. One of the most useful purposes served by the velometer is to measure the air discharged through a ventilation grille. For this purpose a special jet is used.

* Extracts from a paper entitled "Measurement of the Flow of Liquids and Gases, by E. Ower, B.Sc., A.C.G.I., F.R.Ae.S., read at a meeting of the Institution of Chemical Engineers at Burlington House last Tuesday.

British Chemical and Dyestuffs Traders' Association

Problems of Supply, Import and Export

THE seventeenth annual general meeting of the members of the British Chemical and Dyestuffs Traders' Association, Ltd., was held at the Great Eastern Hotel, London, E.C.2, on May 1, Mr. A. F. Lawson (the chairman) presiding. The Chairman pointed out that in former years it had been customary for the annual general meeting to follow the Association's luncheon but owing to the present difficult times and to the pressure of other matters it had been decided not to hold a luncheon this year. Mr. Lawson added that as soon as conditions permitted the Association's annual luncheon would be resumed. Following the adoption of the audited accounts, Mr. Lawson in the course of his report on the year's work of the Association said:—

"I can say with confidence that the work performed on behalf of the trade generally and for individual firms in particular has been highly appreciated by members. Not only have the interests of chemical merchants been safeguarded but members have received a prompt and valuable service of information on a vast number of subjects which are now of everyday importance to traders. Whatever questions arise in connection with a control order, licensing restrictions, war risk insurance, import duties or customs regulations—and these touch on but a few of the emergency measures now in operation—the Association is always at hand to advise and to help you to surmount your particular problem. Numerous inquiries are being answered daily by the staff of the Association and I want members to realise that the use of the Association in this way helps considerably to lighten the task of the various Government Departmental officials, who prefer to deal with representative bodies rather than with individual firms.

"Your Council has devoted much time to considering questions which have arisen out of war-time conditions affecting the interests of members. To-day, as never before, it is necessary that there should be close co-operation between industry and Government, and the work of trade associations plays an important part in the operation of various emergency measures. I am pleased to record that the relations between the Association and the Government departments continue to be most cordial. Quite a few of the control orders that have been introduced concern the chemical industry. As merchants and distributors we dislike trade control in any form but we recognise the necessity for proper supervision of supplies of those materials essential for war requirements."

Raw Material Inquiry Service

Referring to the Association's discussions with Ministry of Supply, Mr. Lawson stated that there was no doubt that the Supply departments recognised that the services of the distributor established a very important link between the manufacturer and the consumer. Continuing, he said:—

"The Association has been able to assist in overcoming problems connected with sources of supply of raw materials and in order that inquiries could be more promptly dealt with the secretary has compiled from information furnished by members an index of chemicals and their merchant suppliers and this, I understand, has proved an extremely useful reference. The question of maintaining adequate supplies of certain chemicals for consuming industries is constantly under consideration and here it must be stated that, thanks to the enterprise of the merchant, supplies of quite a few chemicals not obtainable from home sources have been made available in this country. Your Council considered it advisable to set up a sub-committee to examine the effect of war-time restrictions on supplies of these raw materials and the discussions which this sub-committee has had with other representative associations have established a measure of co-operation which should prove very beneficial to all concerned.

Mr. Victor Blagden, President of the B.C.D.T.A.

"The list of goods which may be imported only under licence includes a wide range of chemicals and therefore the manner in which these regulations were to be operated called for the close attention of the Association; I think you will agree with me when I say there has been no cause for anxiety. Careful examination of statements of past trading submitted by applicants has enabled the Import Licensing Department to protect the interests of established traders, and energetic efforts have been made to give prompt consideration to applications. The Department must be congratulated on the able and fair manner in which it has carried out its onerous task.

Chemical Export Developments

"For some time now the Government has been urging industry to give more attention to export markets and in order to further this work the Board of Trade has appointed the Export Council who will co-operate with Export Groups in individual industries. In the chemical industry a very substantial export business has been built up by merchants who, I think, can justly claim to have laid the foundation of much of this country's overseas trade, and an established merchant organisation can conduct export trade more effectively and at a lower cost than the individual producer. In consultation with the Export Council the Association has under consideration the formation of a Merchants' Export Group for chemicals. This group, membership of which would be open to all chemical merchants with export interests, would, of course, work in close touch with the export groups representing the interests of manufacturers in the various branches of the chemical industry. Such a group would aim at removing and overcoming any obstacles hindering the expansion of trade in export markets and generally to help in the national export drive."

In concluding his report, Mr. Lawson thanked the President and members of the Executive Council for their loyal support and the report was adopted with expressions of warm approval.

The following were then elected to serve as officials of the Association for the ensuing year:—President, Mr. Victor Blagden; vice-presidents, Mr. A. F. Butler and Mr. S. J. C. Mason; chairman, Mr. A. F. Lawson; vice-chairman, Mr. F. A. Waugh; hon. treasurer, Mr. W. Beckley; hon. auditor, Mr. B. C. Hughes; executive council, Mr. J. F. A. Segner (Frank Segner and Co., Ltd.), Mr. A. E. Reed (A. Elder Reed and Co., Ltd.), Mr. C. W. Lovegrove (Chas. Page and Co., Ltd.), and Mr. S. R. Price, M.B.E., M.A. (Price Stutfield and Co., Ltd.).

Personal Notes

MR. THOMAS MIDGLEY, JR., vice-president of the Ethyl Gasoline Corporation, has been re-elected chairman of the board of directors of the American Chemical Society.

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MR. E. H. CLIFFORD, consulting mining engineer to the British South Africa Co., has been appointed by the Minister of Supply as an additional member of the Committee on the production of non-ferrous metallic ores in the U.K.

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DR. ARDERN, consulting chemist to the Manchester Corporation Rivers Committee, has tendered his resignation, this to be effective from September 30. A sub-committee which has been considering the staffing situation reports that it is not now necessary to appoint another whole-time or part-time consulting chemist.

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DR. ALAN N. CAMPBELL, M.Sc., Ph.D. (Lond.), D.Sc. (Aberdeen), assistant Professor of Chemistry at Manitoba University, Winnipeg, who was for some years assistant in the Chemistry Department at Aberdeen University, and is a recognised authority on physical chemistry, has been elected a Fellow of the Royal Society of Canada.

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SUB-LIEUT. GILBERT WARDLE, who is among those posted by the Admiralty as missing from the submarine *Sterlet*, is a son of Mr. G. C. Wardle, chairman of Joshua Wardle, Ltd., weighters, dyers and finishers, Leek, Staffordshire. He is a twin brother of Sub-Lieut. Geoffrey Wardle, who was rescued from the submarine *Starfish* (THE CHEMICAL AGE, February 3) and is now a prisoner in Germany.

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The gold medal of the Australasian Institute of Mining and Metallurgy for 1939 has been awarded to SIR HERBERT GEPP "in recognition of his services to mining and metallurgy, and particularly in connection with the development of flotation processes in the treatment of complex sulphide ores and with the establishment of the electrolytic zinc industry in Australia." The presentation will be made at the next meeting of the Institute, to be held at Broken Hill in August.

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MR. H. B. CROLE-REES retires on pension next month from the service of Benn Brothers, Ltd., the proprietors of THE CHEMICAL AGE. A year or two before the last war he began an association with *The Cabinet Maker*, which has remained unbroken until to-day. He was manager of the paper during a period of unprecedented expansion, to which he largely contributed by the driving power of a seemingly inexhaustible energy. Soon after the last war he became a director of the company, and since 1927 he has discharged the duties of managing director.

OBITUARY

MR. BENJAMIN WARD, who died recently, was managing director of Ward's Shoddy Manures, Ltd., Heckmondwike.

New Control Orders

Chromium Compounds

UNDER the Import of Goods (Prohibition) (No. 18) Order, 1940, chromium compounds have been added to the classes of goods which may be imported only under licence issued by the Board of Trade. The Order covers not only such compounds as chromium acetate, chromium sulphate, chromic acid and chrome mordants, etc., but also such substances as chromates and bichromates. The Order came into force on May 10.

ITALY HAS PURCHASED between ten and twenty thousand tons of American copper for delivery before the end of the current year.

British Association of Chemists

Annual Meeting

THE London Section of the British Association of Chemists held its annual meeting at Broad Street Station Restaurant, London, E.C., on May 3. Mr. S. Linfoot (who had served as chairman since Major Porter had rejoined the Forces and resigned the chairmanship) was re-elected chairman for the ensuing year. Miss W. Wright and Mr. W. Littlejohn were re-elected joint secretaries, and Mr. H. Langwell was re-elected hon. treasurer. The following were elected to fill vacancies on the committee: Mr. A. J. Baker, Mr. H. C. Highet, Dr. G. W. Himus, Mr. W. C. Peck, Mr. J. L. Pinder, and Dr. H. G. Shatwell.

Although the war had curtailed the programme arranged for the past winter, the Section Committee has been very active, and an interesting programme for the coming winter is being planned. The report of the secretaries showed that there has been a steady increase in membership of the Section. Miss Wright gave particulars about the Association's Unemployment Benefit Fund, which has a reserve of more than £20,000. After a successful period of operation the rules governing the fund have been revised; amendments came into operation on July 1, 1939, providing for certain extra benefits to members. An arrangement has been concluded with the appropriate Government Department whereby members receiving Government insurance may do so through the head office of the B.A.C. Mr. C. B. Woodley (General Secretary) commented on some of the activities of the Association, including successful claims made for income-tax rebates on behalf of members, the work of the Appointments Service, and the Legal Aid Department, which department is available to aid members when considering agreements.

A resolution was put forward by some members expressing alarm in regard to the growing tendency among London firms to curtail vacations this year, and pressing for appropriate action. The feeling expressed fairly widely seemed to be that most firms were quite reasonable in regard to that matter; and it was left for the committee to discuss.

Small Manufacturers' Association

Formation of Associated Smaller Manufacturers, Ltd.

ASSOCIATED Smaller Manufacturers, Limited, was registered on April 23 as a company limited by guarantee without share capital. The original number of members is 10. Each member is liable for £1 in the event of winding-up. The objects are to promote commerce, manufactures and trades, and in particular the trades of manufacturers of and dealers in chemicals and the by-products thereof, and many other materials, founders and casters of metals, woodworkers, etc., engineers, printers, import, export and general merchants and agents; to enable associations, federations, institutions or groups in the said trades to federate or co-operate, to act as representative and mouthpiece of such associations, federations, institutions or groups, etc.

The subscribers are John A. R. McDonald, 30/4 Dalling Road, Hammersmith, W.6, company director; and Peter D. Thomas, 35 Palace Mansions, Kensington, W.14. The management is vested in a council consisting of not less than five nor more than 30 members. The subscribers are to appoint the first members of the Council. The solicitor is W. F. Gillham, 12 South Square, Gray's Inn, W.C.1, and the file number is 360,778.

MUCH ATTENTION IS BEING GIVEN in Germany to the problem of extracting vanadium or ferrovanadium from crude iron. A report in *Angewandte Chemie* of March 16 states that several satisfactory processes are now in operation. Moreover a process has been evolved for production of high-phosphorus and low-carbon manganovanadium by fusion electrolysis of vanadium-containing slags.

General News

PECTIN IMPORTS for 1939 from the U.S.A. amounted to 198,995 lb., valued at $130,370, as against 125,290 lb. in 1938, priced at $89,374.

MESSRS. REX CAMPBELL AND CO., LTD., and the Chemical Supply Company, have returned to their city offices at 7 and 8 Idol Lane, London, E.C.3.

IMPORTANT MEASURES ARE BEING TAKEN by the Government to strengthen the arrangements for the control of the light alloy materials needed for aircraft manufacture, the Air Ministry announced last Monday. Sir Samuel Hoare, the Air Minister, has appointed Brigadier-General H. A. Jones to be Controller of Light Alloys.

CRAFTSMEN IN THE SCOTTISH iron and steel trades are to receive an advance in wages of 5s. a week, to date from February 18, according to an award issued by the Industrial Court last week. All craftsmen covered by the terms of reference employed on the three-shift system are to receive an additional advance of 2s. a week.

THE JOINT COMMITTEE ON VITREOUS ENAMELLING, 21 St. Paul's Square, Birmingham, 3, has just issued a useful "Glossary of Terms in Use in the Vitreous Enamelling Industry," by Dr. G. T. O. Martin, price 1s. post free. It is justly claimed that this will help those outside the industry to a better understanding of papers on the subject, and will serve to establish terms entirely free from ambiguity.

THE DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH has issued the first of a series of war-time bulletins, which will deal with current building problems and describe work carried out under the guidance of a committee of the Building Research Board formed at the instance of the Works and Buildings Priority Sub-Committee of the Ministerial Committee on Priority. The bulletin is entitled "Economical Type Designs in Structural Steelwork for Single Storey Factories" (H.M.S.O. 1s. net).

SPEAKING AT A LECTURE on "Modern Development of Paint" to the Chester Engineering Society a few days ago, Mr. E. C. Evans, technical director of Goodlass Wall and Co., Ltd., pointed out that there was no need to "blame the paint" nowadays if the manufacturer was consulted in the first instance. Intensive research had caused great changes in the paint industry lately. For example, the difficult problem of protecting the steel structures in rayon works had been entirely overcome. Aluminium paint had been introduced to withstand continuous red-hot conditions.

NYLON, HAILED IN AMERICA and awaited in Great Britain as the new high-grade fibre for the textile trade, will first reach the public not in the anticipated form of stockings, but as toothbrushes. Two British manufacturers, Messrs. Addis and Messrs. Halex, Ltd., are marketing towards the end of May toothbrushes which in appearance will not differ from their well-known products of the past, but which will, in fact, have synthetic bristles produced from nylon. The significance of the use of this new material for synthetic bristle manufacture lies in the superiority of nylon over natural bristles, and in the fact that they are made from an indigenous material—like dyestuffs, nylon is derived ultimately from coal. Nylon brushes will retail at the normal prices of high-grade brushes.

Foreign News

AMERICAN EXPORTS OF FORMALDEHYDE for last year were 3,925,762 lb. worth $177,194, more than double the figures for 1938, and representing the highest level reached for some time.

UNDER THE TRADE AGREEMENT recently signed with Japan, Spain will purchase silk, rayon, menthol, camphor and other chemical products. In return, Japan will purchase from Spain industrial salts, potash, mercury and other Spanish products.

HUNGARIAN PAT. 122,564, which covers methane production from the sewage sludge of the Budapest gutters and from the decaying vegetable matter of fallen leaves, is reported to be on the point of utilisation in Hungary. Closed containers are used under the patent, and fully decomposed activated sludge is used for inoculating. Decomposition is complete within 40 to 45 days, and the methane yielded is quite pure. The remaining solid matter is said to be an excellent fertiliser.

From Week to Week

AMONG THE IMPORTANT DEVELOPMENTS which are reported to have taken place in Shanghai's chemical industry during the last year is the commencement of the construction of two large plants, one to produce hydrochloric acid, the other sodium sulphate. Preparations were also made to erect two industrial alcohol plants. A glycerol plant began operations and four plants started making red lead, lead acetate, and zinc sulphate.

AUTHORISATIONS BY THE ITALIAN GOVERNMENT for new chemical plant include the following: phosphoric acid and diammonium phosphate (Ammonia e Derivati, Milan); oleum by the contact process (S.A. Leghe e Metalli, Genoa); trichloride, pentachloride and oxychloride of phosphorus (S.A. Appula, Milan); plasticisers for nitrocellulose and cellulose acetate (Distillerie Italiane S.A., Milan); furfural, synthetic resins and moulding powders (Edoardo Pessi, Padua).

RESULTS OF THE ETABLISSEMENTS KUHLMANN for the trading period ending August 31, 1939 (an exceptional period of eight months) record a trading profit of 47,877,188 fr. (against 36,048,370 fr. for the previous 12 months). Profits from investments, etc., totalled 5,014,405 fr. (against 5,830,111 fr.), giving a total of 52,891,594 fr. (against 41,878,482 fr.). After a contribution to statutory reserves, the sum available for distribution is 54,699,454 fr. (against 43,607,078 fr.), and the previous dividend of 30 fr. per share will be maintained.

GROSS PROFITS of the C.I.B.A., of Basle, for 1939 totalled 19,400,000 fr., the highest figure reached in the history of the company, as compared with 16,071,000 fr. in 1938. Among news of the foreign subsidiaries, it was reported that the Pabianicer A.G. für Chemische Industrie, of Pabianice/Lodz (Poland), had been well employed up to the outbreak of war, and had now resumed activities after being closed down during the German invasion, although sales conditions had considerably changed. Sales of the Clayton Aniline Works, Ltd., of Manchester, had shown a slight improvement, and results remained satisfactory.

PRESS REPORTS APPEARING OUTSIDE FRANCE, states an American consular report from Paris, have contended that the French potash mines are too near the Maginot Line to permit commercial exploitation at present, and have indicated that such shipments as are being made are drawn from stocks which existed at the outbreak of war. Although no monthly statistics have been published on mineral production in France since August, 1939, it is understood in informed trade circles that, while a slowing-up in output probably occurred on mobilisation, production in the potash mines has recovered rapidly and at present the output is close to maximum levels. In August last the total output was 45,000 tons of pure potash, as compared with 26,800 tons in the corresponding month of 1938. For the first eight months of 1939, total production amounted to 428,100 tons as compared with 382,700 in the corresponding period of 1938, and with 581,800 for the whole of 1938. The output of 1938 represents a maximum tonnage in the years for which official production statistics are available.

Forthcoming Events

THE EIGHTH ANNUAL MEETING of the Plastics Group, Society of Chemical Industry, will be held on May 16 at 6.30 p.m. at the Barley Mow Hotel, Horseferry Road, London, S.W.1. Afterwards an informal meeting will be held, starting with supper at 7 (for 7.30) at a cost of 3s. per head, followed by an informal discussion on "Need Chemists be Orators?"

PROFESSOR J. C. DRUMMOND, Scientific Adviser to the Ministry of Food, will give the next informal luncheon talk at the Chemical Club, on "Essentials of War-time Diet." This will be on May 20 in the Club's premises at 2 Whitehall Court, London, S.W.1. Luncheon will be served at 1 p.m., and the lecture will start at about 2 p.m.

A JOINT MEETING OF THE INSTITUTE OF FUEL and the Coke Oven Managers' Association will be held on May 23, at 6 p.m., in King's College, Newcastle-on-Tyne, when Dr. R. A. Mott will present a paper entitled: "Coals Dangerous to Oven Walls."

THE INSTITUTE OF FUEL will hold a meeting on May 30, at 6 p.m., in the Connaught Rooms, Great Queen Street, London, W.C.2, at which Dr. A. A. Hirst will present a paper entitled: "A Coal Cleaning Policy."

Weekly Prices of British Chemical Products

CONDITIONS in the general chemical market continue to follow a very steady course although the volume of firm buying orders for spot or near delivery is only of moderate dimensions. So far as existing contracts are concerned deliveries are fully maintained and in this respect the movement of chemicals into consumption is substantial. A good demand is noted for potassium permanganate, yellow prussiate of potash, barium chloride and oxalic, tartaric and citric acids. Lead oxides and white lead are in good request with the convention scale of quotations unchanged. A rise of 10s. per ton in the price of sodium chlorate is reported owing to higher costs of carriage. In other directions prices remain firm. In the tar products section a fair spot business is reported for most items although little interest is displayed in forward bookings. Values in this market remain steady at recent levels.

MANCHESTER.—For the most part prices of chemical products on the Manchester market during the past week have been well maintained, with a tendency towards still higher levels strongly in evidence in several sections. Buying interest this week has been moderately active and good quantities of textile bleaching and finishing products continue to be taken up. Scarcity of prompt offers of oxalic and citric and tartaric acids, as well as of bichromates and prussiates, is a feature, and spot parcels are readily securing high rates. In the by-products market pitch is very strong, but carbolic acid is easy. Supplies of refined naphthalene are restricted.

GLASGOW.—Spot and contract business has been maintained at normal level in the Scottish heavy chemical market. Prices are firm in most sections with a tendency to rise in others. Increases have been noted for hyposulphite of soda, lime and china clay, and a slight reduction has taken place in the price of casein. Difficulties are being experienced for export to the Near East owing to the restrictions on shipping in the Mediterranean. The future position of glucose and starch has now become clear and supplies and prices for these products will be more stable than in recent months.

Price Changes

Rises: Calcium Acetate (Manchester); Citric Acid (Manchester); Naphthalene; Pitch (Manchester); Sodium Chlorate; Tartaric Acid (Manchester).

Falls: Carbolic Acid, crystals and crude (Manchester).

* In the case of certain products, here marked with an asterisk, the market is nominal, and the last ascertainable prices have been scheduled. At present all intermediates are included under this head.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton £36 10s.; 10 cwt./1 ton, £37 10s.; 4/10 cwt., £38 10s.; 80% pure, 1 ton, £38 10s.; 10 cwt./1 ton, £39 10s.; 4/10 cwt., £40 10s.; commercial glacial, 1 ton, £46; 10 cwt./1 ton, £47; 4/10 cwt., £48; delivered buyers' premises in returnable barrels. £4 per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 50 tons and over, £52 10s.; 10/50 tons, £53; 5/10 tons, £53 10s.; 1/5 tons, £54; single drums, £55, delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each; delivered in containers of less than 45 gallons but not less than 10 gallons £10 10s. per ton in excess of maximum prices; delivered in containers less than 10 gallons each £10 10s. per ton in excess of maximum prices, plus a reasonable allowance.

***Alum.**—Loose lump, £8 7s. 6d. per ton d/d.

***Aluminium Sulphate.**—About £8 per ton f.o.b. Liverpool.

Ammonia Anhydrous.—99.95%, 1s. to 2s. per lb., according to quantity in loaned cylinders, carriage paid; less for important contracts.

Ammonium Carbonate.—£32-£36 per ton d/d in 5 cwt. casks.

Ammonium Chloride.—Grey galvanising, £18 per ton, in casks, ex wharf. See also Salammoniac.

***Antimony Oxide.**—£68 per ton.

Arsenic.—99/100%, about £25 per ton, ex store.

Barium Chloride—98/100%, prime white crystals, £11 10s. 0d. to £13 per ton, bag packing, ex works; imported material would be dearer.

Bleaching Powder.—Spot, 35/37% £10 per ton in casks, special terms for contract.

Borax, Commercial.—Granulated, £20 10s. per ton; crystal, £21 10s.; powdered, £22; extra finely powdered, £23; B.P. crystals, £29 10s.; powdered, £30; extra fine: £31 per ton for ton lots in free 1-cwt. bags, carriage paid in Great Britain. Borax Glass, lump, £64; powder, £65; in tin-lined cases for home trade only, packages free, carriage paid in Great Britain.

Boric Acid.—Commercial granulated, £34 10s. per ton; crystal £35 10s.; powdered, £36 10s.; extra finely powdered, £38 10s.; large flakes, £47; B.P. crystals, £43 10s.; powdered, £44 10s.; extra fine powdered, £46 10s. per ton for ton lots, in free 1-cwt. bags, carriage paid in Great Britain.

Calcium Bisulphite.—£6 10s. to £7 10s. per ton f.o.r. London.

***Calcium Chloride.**—GLASGOW: 70/75% solid, £5 12s. 6d. per ton ex store.

Charcoal Lump.—£10 to £12 per ton, ex wharf. Granulated £11 to £14 per ton according to grade and locality.

***Chlorine, Liquid.**—£19 15s. per ton, d/d in 16/17 cwt. drums (3-drum lots); 4½d. per lb. d/d station in single 70-lb. cylinders.

Chrometan.—Crystals, 4d. per lb.; liquor, £19 10s. per ton d/d station in drums. GLASGOW: Crystals 4d. per lb. in original barrels.

Chromic Acid.—1s. per lb., less 2½%; d/d U.K. GLASGOW: 1s. 0½d. per lb. for 1 cwt. lots.

Chromic Oxide.—Green, 1s. 4d. per lb., d/d U.K.

Citric Acid.—1s. 2d. per lb. MANCHESTER: 1s. 4¾d.

***Copper Sulphate.**—Nominal.

Cream of Tartar.—100%, £6 2s. to £6 7s. per cwt., less 2½%, d/d in sellers' returnable casks; imported material would be dearer.

Formic Acid.—85%, £44 10s. per ton for ton lots, carriage paid, carboys returnable; smaller parcels quoted at 46s. 6d. to 49s. 6d. per cwt., ex store.

Glycerine.—Chemically pure, double distilled, 1,260 s.g., in tins, £3 10s. to £4 10s. per cwt. according to quantity; in drums, £3 2s. 6d. to £3 16s. 0d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, 1s. 4d. per lb.; free-running crystals are quoted at 1s. 7½d. to 1s. 10½d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 6s. 1½d. to 8s. 7½d. carboy d/d according to purity, strength and locality.

Iodine.—Resublimed B.P., 9s. 2d. to 13s. per lb., according to quantity.

Lactic Acid.—Dark tech., 50% by vol., £33 per ton; 50% by weight, £38;; 80% by weight, £67; pale tech., 50% by vol., £39 10s.; 50% by weight, £46, 80% by weight, £74. Not less than one ton lots ex works; barrels returnable, carriage paid.

Lead Acetate.—White, £48 to £50, ton lots.

Lead Nitrate.—About £44 per ton d/d in casks.

Lead, Red.—English, 5/10 cwt., £41 10s.; 10 cwt. to 1 ton, £41 5s.; 1/2 tons, £41; 2/5 tons, £40 10s.; 5/20 tons, £40; 20/100 tons, £39 10s.; over 100 tons, £39 per ton, less 2½ per cent., carriage paid; non-setting red lead, 10s. per ton dearer in each case; Continental material, £1 per ton cheaper.

Lead, White.—Dry English, less than 5 tons, £51; 5/15 tons, £47; 15/25 tons, £46 10s.; 25/50 tons, £46; 50/200 tons, £45 10s. per ton, less 5% carriage paid; Continental material, £1 per ton cheaper. Ground in oil, English, 1/5 cwt., £59 10s. 5/10 cwt., £58 10s.; 10 cwt. to 1 ton, £58; 1/2 tons, £56 10s.; 2/5 tons, £55 10s.; 5/10 tons, £53 10s.; 10/15 tons, £52 10s.; 15/25 tons, £52; 25/50 tons, £51 10s.; 50/100 tons, £51 per ton, less 5% carriage paid. Continental material £2 per ton cheaper.

Litharge.—1 to 2 tons, £41 per ton.

Magnesite.—Calcined, in bags, ex works, about £12 to £15 per ton.

Magnesium Chloride.—Solid (ex wharf), £12 to £13 5s. per ton.

Magnesium Sulphate.—Commercial, £12 to £14 per ton, according to quality, ex works.

Mercury Products.—Controlled price for 1 cwt. quantities: Bichloride powder, 12s. 3d.; bichloride lump, 12s. 10d.; ammon. chloride powder, 14s. 2d.; ammon. chloride lump, 14s.; mercurous chloride, 14s. 7d.; mercury oxide, red cryst., B.P., 16s. 4d.; red levig. B.P., 15s. 10d.; yellow levig. B.P. 15s. 9d.

***Methylated Spirit.**—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities.

***Nitric Acid.**—Spot, £19 to £26 per ton, according to strength, quantity and destination.

Oxalic Acid.—From £60 per ton for ton lots, carriage paid, in 5-cwt. casks; smaller parcels would be dearer; deliveries slow.

***Paraffin Wax.**—Nominal.

Potash, Caustic.—Liquid, £30 to £35 per ton, according to quantity.

Potassium Bichromate.—6d. per lb., carriage paid.

Potassium Carbonate.—96/98%, quoted between £37 10s. and £40 per ton.

Potassium Chlorate.—Imported powder and crystals, ex store London, 10d. to 1s. per lb.

Potassium Iodide.—B.P., 8s. to 11s. 2d. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, £26 to £29 per ton ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 4½d. to 1s. 5½d. per lb.; commercial, £7 9s. 6d. to £8 1s. 6d. per cwt., according to quantity, d/d.

Potassium Prussiate.—Yellow, about 1s. 2d. to 1s. 5d. per lb., supplies scarce.

Salammoniac.—Dog-tooth crystals, £45 per ton; medium, £43 10s.; fine white crystals, £16 10s.; in casks, ex store.

Soda, Caustic.—Solid, 76/77% spot, £14 per ton d/d station.

Soda Crystals.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

Sodium Acetate.—£37 to £40 per ton, ex wharf.

Sodium Bicarbonate.—About £10 10s. to £11 10s. per ton, in bags.

Sodium Bichromate.—Crystals, 5d. per lb., net d/d U.K. GLASGOW: 5¾d. per lb., carriage paid.

Sodium Bisulphite Powder.—60/62%, £16 per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£32 10s. to £41 10s. per ton, d/d, according to quantity.

Sodium Hyposulphite.—Pea crystals, £17 15s. per ton for 2-ton lots; commercial, £13 10s. per ton. MANCHESTER: Commercial, £13; photographic, £16 15s.

Sodium Iodide.—B.P., for not less than 28 lb., 8s. 10d. per lb.; for not less than 7 lb., 10s. 9d. per lb.

***Sodium Metasilicate.**—£14 5s. per ton, d/d U.K. in cwt. bags.

Sodium Nitrate.—Refined, £9 10s. to £10 per ton for 6-ton lots d/d.

Sodium Nitrite.—£18 15s. per ton for ton lots.

Sodium Perborate.—10%, £4 10s. per cwt. d/d in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £16 to £17 per ton delivered for ton lots. Tri-sodium, £20 per ton d/d for ton lots.

Sodium Prussiate.—From 6d. per lb. ex store.

Sodium Silicate.—£8 2s. 6d. per ton, for 4-ton lots.

Sodium Sulphate (Glauber Salts).—£4 10s. per ton d/d.

Sodium Sulphate (Salt Cake).—Unground, Spot, £4 1s. per ton d/d station in bulk. MANCHESTER: £4.

Sodium Sulphide.—Solid 60/62%, Spot, £13 15s. per ton d/d in drums; crystals, 30/32%, £9 10s. per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £13; crystals, £9 15s.

Sodium Sulphite.—Pea crystals, spot, £16 per ton d/d station in kegs; commercial, £11 per ton d/d station in bags.

***Sulphur Precip.**—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

Sulphuric Acid.—168° Tw., £6 2s. 3d. to £6 13s. 3d. per ton; 140° Tw., arsenic-free, £4 7s. 6d. to £4 17s. 6d. per ton; 140° Tw. arsenious, £4 per ton; quotations naked at sellers' works.

Tartaric Acid.—1s. 6½d. per lb., less 5%, carriage paid for lots of 5 cwt. and upwards. Makers' prices nominal; imported material 2s. 3d. to 2s. 6d. per lb., ex wharf. MANCHESTER: 1s. 8d. per lb.

Zinc Oxide.—Maximum prices: White seal, £30 17s. 6d. per ton; red seal, £28 7s. 6d. d/d; green seal, £29 17s. 6d. d/d buyers' premises.

Zinc Sulphate.—Tech., about £25, carriage paid, casks free.

Rubber Chemicals

Antimony Sulphide.—Golden, 10½d. to 1s. 7½d. per lb., according to quality. Crimson, 1s. 9d. to 1s. 11d. per lb.

Arsenic Sulphide.—Yellow, 1s. 6d. to 1s. 8d. per lb.

Barytes.—Imported material £6 to £9 per ton according to quality.

Carbon Black.—About 7d. to 7½d. per lb., according to quantity.

Carbon Bisulphide.—£31 to £36 per ton, according to quantity, in free returnable drums.

Carbon Tetrachloride.—£50 to £55 per ton, according to quantity, drums extra.

India-rubber Substitutes.—White, 5¾d. to 6¾d. per lb.; dark 5½d. to 6d. per lb.

Lamp Black.—Imported material is quoted at about £35 to £40 per ton.

Lithopone.—30%, £18 17s. 6d. per ton; 60%, £31 to £32 per ton. Imported material would be dearer.

Sulphur.—Finely powdered, about £15 per ton, delivered.

Sulphur Chloride.—6d. to 8d. per lb., according to quantity.

Vegetable Black.—£35 per ton upwards; 28/30%, £15 10s. 0d.; 60%, £29, delivered buyers' premises.

Vermilion.—Pale or deep, 11s. per lb., for 7 lb. lots.

Zinc Sulphide.—About £63 per ton ex works.

Plus 5% War Charge.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots d/d farmer's nearest station, March/June, £9 6s.

Calcium Cyanamide.—£12 10s. for 5-ton lots per ton net f.o.r. or ex store, London. Supplies small.

"Nitro-Chalk."—£8 18s. per ton, in 6-ton lots, d/d farmer's nearest station, January/June delivery.

Concentrated Complete Fertilisers.—£11 18s. to £12 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Ammonium Phosphate Fertilisers.—£11 14s. to £16 6s. per ton in 6-ton lots, d/d farmer's nearest station.

Coal Tar Products

Benzol.—Industrial (containing less than 2% of toluol), 2s. to 2s. 1d. per gal., ex works, nominal.

Carbolic Acid.—Crystals, 9d.-11d. per lb.; Crude, 60's, 3s. 3d. to 3s. 6d., according to specification. MANCHESTER: Crystals, 11d. per lb., d/d; crude, 3s. 6d. naked, at works.

Creosote.—Home trade, 5d. per gal., f.o.r., makers' works; exports 6d. to 6¼d. per gal., according to grade. MANCHESTER: 4¾d. to 7d.

Cresylic Acid.—99/100%, 2s. 11d. to 3s. 3d. per gal., according to specification. MANCHESTER: Pale, 99/100%, 2s. 9d.

Naphtha.—Solvent, 90/160°, 1s. 7d. to 1s. 8d. per gal.; solvent, 95/160°, 1s. 11d. to 2s., naked at works. MANCHESTER: 90/160° 1s. 9d. to 1s. 11d. per gal.

Naphthalene.—Crude, whizzed or hot pressed, £10 to £11 per ton; purified crystals, £23 per ton in 2-cwt. bags; flaked, £23 15s. per ton. Fire-lighter quality, £6 to £7 per ton ex works. MANCHESTER: Refined, £26.

Pitch.—Medium, soft, 55s. per ton, f.o.b. MANCHESTER: 52s. 6d. to 55s. f.o.b. East Coast.

Pyridine.—90/140°, 19s. to 25s. per gal.; 90/160°, 18s. 6d. to 19s. 6d.; 90/180°, 4s. to 5s. per gal., f.o.b. MANCHESTER: 18s. to 21s. per gal.

Toluol.—Pure, 2s. 5d., nominal. MANCHESTER: Pure, 2s. 5d. per gal., naked.

Xylol.—Commercial, 2s. 9d. per gal.; pure, 2s. 11d. MANCHESTER: 2s. 11d. per gal.

Wood Distillation Products

Calcium Acetate.—Brown, £8 10s. to £9 per ton; grey, £13 to £14. MANCHESTER: Grey: £18.

Methyl Acetone.—40.50%, £42-£45 per ton.

Wood Creosote.—Unrefined, 1s. to 1s. 6d. per gal., according to boiling range.

Wood Naphtha, Miscible.—3s. 10d. to 4s. per gal.; solvent, 4s. to 4s. 6d. per gal.

Wood Tar.—£5 to £6 per ton, according to quality.

*Intermediates and Dyes

m-**Cresol** 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

o-**Cresol** 30/31° C.—8d. to 9d. per lb. in ton lots.

p-**Cresol** 34/35° C.—1s. 8d. to 1s. 9d. per lb. in ton lots.

Dichloraniline.—2s. 7d. per lb.

Dinitrobenzene.—8d. per lb.

Dinitrotoluene.—48/50° C., 9d. per lb.; 66/68° C., 11½d.

Nitrobenzene.—Spot, 5½d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

Nitronaphthalene.—10d. per lb.; P.G., 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.

p-**Toluidine.**—2s. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—May 9.—For the period ending June 1, per ton, net, naked, ex mill, works or refinery, and subject to additional charges according to package and location of supplies:—LINSEED OIL, raw, £47 10s. RAPESEED OIL, crude, £44 5s. COTTON SEED OIL, crude, £31 2s. 6d.; washed, £34 5s.; refined edible, £35 12s. 6d.; refined deodorised, £36 10s. SOYA BEAN OIL, crude, £33; refined deodorised, £37. COCONUT OIL, crude, £28 2s. 6d.; refined deodorised, £31 7s. 6d. PALM KERNEL OIL, crude, £27 10s.; refined deodorised, £30 15s. PALM OIL, refined deodorised, £33. GROUNDNUT OIL, crude, £35 10s.; refined deodorised, £40. WHALE OIL, crude hardened, 42 deg., £30 10s.; refined hardened, 42 deg., £33. ACID OILS.—Groundnut, £24; soya, £22; coconut and palm kernel, £22 10s. ROSIN, 25s. to 35s. per cwt., ex wharf, according to grade. TURPENTINE, 53s. per cwt., spot, American, including tax, ex wharf, barrels, and ex discount.

HULL.—May 8.—American turpentine, spot, 54s. 6d. per cwt. in barrels ex store.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

County Court Judgments

MILES & COOPER (CHEMICALS), LTD., 44 Longbridge Road, Barking, manufacturing chemists. (C.C.J., 11/4/40.) £13 8s. 6d. March 14.

SILEXORE, LTD. R.O., 23 Broadwater Road, Welwyn Garden City, paint and distemper manufacturers. (C.C.J., 11/4/40.) £12 15s. 10d. March 18.

B. B. TECHNICAL LABORATORIES, LTD. Mowbray House, Ealing Road, Northolt, manufacturing chemists. (C.C.J., 11/4/40.) £12 16s. 10d. March 10.

Companies Winding-Up Voluntarily

ALLIANCE CARBIDE COMPANY, LTD. (C.W.U.V. 11/5/40.) R. T. Arnold, of 34 Victoria Street, London, S.W.1, appointed liquidator.

BRISTOL CARBIDE COMPANY, LTD. C.W.U.V. 11/5/40.) R. T Arnold, of 34 Victoria Street, London, S.W.1, appointed liquidator.

BRITISH ACETATE ACID COMPANY, LTD. (C.W.U.V. 11/5/40.) R. T. Arnold, of 34 Victoria Street, London, S.W.1, appointed liquidator.

Company News

Manbré and Garton, Ltd., are maintaining their interim dividend at 5 per cent., less tax.

Eaglescliffe Chemical Co., Ltd., report a profit for 1939 of £9102, as against £7643 for the corresponding period last year.

Cellon, Ltd., report a net profit for 1939 of £42,524 or £14,755 more than in 1938. The ordinary dividend is maintained at 20 per cent. with a payment of a final dividend of 10 per cent.

Snia Viscosa, the Italian rayon manufacturers, have announced a dividend of 25 lire per share of 250 lire each for the year 1939, which is at the same rate as the previous year's distribution.

Alchemy, Ltd., manufacturers of chemical products, etc., Brettenham House, Lancaster Place, Strand, W.C.2, have increased their nominal capital by the addition of £500, in £1 ordinary shares, beyond the registered capital of £1500.

Babcock and Wilcox, Ltd., report that profits last year rose from £848,694 to £881,599, but as " war losses " of £124,936 were written off, the net figure is reduced to £756,663. The ordinary dividend is maintained at 10 per cent., a payment of a final dividend of 6 per cent. The cash bonus is reduced from 2½ per cent. to 1 per cent.

British Drug Houses, Ltd., have decided to alter their dividend on the ordinary capital for 1939 following the request of the Chancellor of the Exchequer that companies should limit dividends to a rate not exceeding that pair in recent years. A dividend of 8 per cent. declared at the end of last month has been reduced to 6 per cent.

Lever Brothers and Unilever, Ltd., have declared a total dividend on the ordinary capital of 10 per cent., the same as for the previous twelve months. As the interim dividend was raised from 4 per cent. to 4¾ per cent. the final dividend will be 5¼ per cent., against 6 per cent. **Lever Brothers and Unilever, N.V.,** are paying a final dividend of 3¼ per cent., making 6¼ per cent., against 7½ per cent.

Stewarts and Lloyds, Ltd., iron and steel tube manufacturers, earned a profit of £1,991,562 in 1939, against £2,049,791 in 1938, and a net profit of £1,213,740, compared with £1,331,234. The consolidated statement shows that the group's profits (other than the profits of the Stanton Ironworks Co.) totalled £1,591,403, against £1,697,870, of which £377,663, against £366,636, has been retained by subsidiary companies.

New Companies Registered

Reginald Maurice, Ltd. (360,805).—Private company. Capital, £100 in 100 ordinary shares of £1 each. Manufacturers of and dealers in chemicals, gases, drugs, medicines, plaster of Paris, disinfectants, etc. Directors: Maurice R. Jackson and Emmanuel Nathan. Registered office: 25 Cheapside, E.C.2.

Permalon, Ltd. (360,887).—Private company. Capital, £100 in 100 shares of £1 each. Dealers in and manufacturers, importers and exporters of chemicals, gases, drugs, etc. Subscribers: Gathorne J. L. Armitage, 37 Woodlands Avenue, New Malden, Surrey, and Leslie G. Russell. Gathorne J. L. Armitage is the first director.

Radium Preparations, Ltd. (360,866).—Private company. Capital, £5000 in £1 shares. Manufacturers, importers and exporters of and dealers in radium, pitchblende, radio active substances and other minerals, ores, salts and deposits and all compounds and by-products thereof, and medicines, drugs, chemicals, gases, etc. Directors: Wm. Manning and Dennis W. Barrett. Secretary: Alfred L. Benzing. Registered office: 1/33 Corporation Row, E.C.1.

Clements Trading Company, Ltd. (360,784).—Private company. Capital £1050 in 1000 5 per cent. cumulative redeemable preference shares of £1 and 1000 ordinary shares of 1s. General merchants, importers, exporters, factors, agents, brokers and dealers in all kinds of goods and merchandise, manufacturers of and dealers in ores, metals, chemicals and other preparations; warehousemen, shipowners, etc. Subscribers: Claude H. Treble, 15 Maybank Avenue, Sudbury, Wembley, Middlesex, and John Richardson. Solicitors: Clifford Turner & Co., 11 Old Jewry, E.C.2.

Chemical and Allied Stocks and Shares

THE chief feature of business on the Stock Exchange has been the continued buoyancy of British Funds and the firmness maintained in other good class securities of the fixed interest-bearing type. Ordinary or equity shares were again very inactive, sentiment having been governed by the disposition to await further developments in connection with the war and international affairs. Moreover, in many cases, prices have been marked down further where it is considered in the market that the new regulations attaching to distributions of public companies will affect dividend prospects.

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It is generally realised that the dividend limitation proposals will not affect the dividend outlook of the majority of companies connected with the chemical and kindred trades. Consequently prices have been quite well maintained in many instances, despite the reactionary trend ruling in most sections of the Stock Exchange. Imperial Chemical at 31s. 7½d. were, in fact, the same as a week ago, and at 32s. 6d. the preference units were virtually unchanged. Publication of the company's full results is imminent and the annual meeting is to take place on May 23. British Match were 1s. lower at 33s., but are now " ex " the dividend, and British Oil & Cake Mills preferred ordinary further improved from 41s. 9d. to 42s. 9d., it being pointed out in the market that the yield on the basis of the 12½ per cent. dividend is not unattractive. On the other hand, although the dividends were in accordance with most market estimates, Lever & Unilever have declined on the week from 29s. 3d. to 27s. 3d. and Lever N.V. from 26s. 3d. to 24s. 9d. B. Laporte were reduced to 66s. 3d. but remained firmly held and it did not appear the price was adequately tested by dealings. Greeff-Chemicals Holdings 5s. units were quoted at 5s. 7½d. and are now " ex " the exterim dividend. Blythe Colour Works 4s. shares were slightly lower at 8s. 3d. and Borax Consolidated at 29s. showed a small decline as compared with a week ago. Prices for Cerebos and Reckitt & Sons ordinary were marked down. The general tendency among iron and steel securities, including Stewarts & Lloyds and Dorman Long, remained relatively satisfactory, the prevailing view being that, on present indications, there seem reasonable prospects of dividends being maintained. There are, however, doubts whether Guest Keen will maintain its distribution as it is possible that some companies which have heretofore declared dividends tax free may in future adopt the more usual less tax method.

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Dunlop Rubber were lowered to 32s. 9d., it being pointed out that the highest payment during the pre-war standard period was 9 per cent. and that distributions during the war will now not be permitted to exceed this rate. Tube Investments were favoured at the slightly higher price of 93s. 9d. because, if earnings allow, the company will be permitted to keep its distribution at 23¾ per cent., which has ruled in recent years. General Refractories were moderately better at 9s. 9d. on the company's good pre-war dividend standard, and market hopes that improvement in earnings is continuing. British Aluminium were again lower because in this case dividend limitation regulations will prevent a higher dividend than the rate distributed last year. Moreover, Wall Paper Manufacturers' deferred units were marked down to 15s. on the decision to discontinue payment of an interim dividend. Pinchin Johnson were little changed at 21s. 3d. but International Paint went back from 83s. 9d. to 82s. 6d. Cellon ordinary shares, however, remained at 15s. on the maintenance of the dividend at 20 per cent.

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Elsewhere, Boots Drug, Timothy Whites, and Sangers were lower, awaiting full details of the Purchase Tax. Beechams Pills deferred were fairly steady around 8s. 6d. pending declaration of the final dividend, while United Molasses were again a relatively steady feature. British Drug Houses were around 23s. following the decision to revise the dividend and pay 6 per cent., the 8 per cent. previously announced being in excess of the highest payment during the pre-war standard period. Oil shares were reactionary, but, exceptionally, Trinidad Leaseholds were slightly higher than a week ago.